Serial No. New Application

REMARKS

Claims 1-54, as amended, remain herein.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached pages are captioned "Version with Markings to Show Changes Made."

This Preliminary Amendment is submitted to place the claims of this application in the condition in which applicant wishes to have them initially examined.

Examination of this application on its merits is respectfully requested.

Respectfully submitted,

PARKHURST & WENDEL, L.L.P.

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Date

Roger W. Parkhurst
Registration No. 25,177
Robert N. Wieland
Registration No. 40,225

RWP:RNW/jmz

Attachment: Version with Markings to Show Changes Made

Attorney Docket No.: OGOH:108

PARKHURST & WENDEL, L.L.P.
1421 Prince Street, Suite 210
Alexandria, Virginia 22314-2805
Telephone: (703) 739-0220

Serial No. New Application

VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Amended) A method for fabricating an LDD thin film transistor, [including] comprising:

forming a semiconductor layer on the substrate;

forming a metal film on the semiconductor layer;

[a provisional gate electrode-making step of] making a provisional gate electrode from [a] the metal film for gate electrode formation by using a resist which has been hardened and patterned by photolithography and postbaking;

[a first impurity-injecting step of] injecting impurities in high concentrations into [a] the semiconductor layer [while] by using as a mask the provisional gate electrode having the resist used to form the provisional gate electrode [thereon] remaining on the provisional gate electrode;

[an isolated resist-etching step of moving] moving both ends of the resist on the provisional gate electrode in a channel direction [towards] toward the center of the resist by etching, thereby exposing surfaces of both ends of the provisional gate electrode in the channel direction;

[a provisional gate electrode end-etching step of] etching the exposed both ends of the provisional gate electrode while using the remaining resist as a mask; and

[a second impurity-injecting step of] injecting impurities in low concentrations into the semiconductor layer while using as a mask a gate electrode completed by etching the both ends of the provisional gate electrode.

2. (Amended) A method for fabricating an LDD thin film transistor, [including] comprising:

forming a semiconductor layer on the substrate;

forming a metal film on the substrate;

coating the metal film with a resist for forming a gate electrode;

[a resist end surface-processing step of] processing the resist into a pattern corresponding to a desired gate electrode, the patterned resist having tapered side surfaces each with a projecting lower edge [processing a resist formed in a position corresponding to a gate electrode in order to pattern a metal film for gate electrode formation in such a manner that side surfaces of

the resist in a channel direction are tapered to broaden downwardly];

[a provisional gate electrode-forming step of] forming a provisional gate electrode by etching the metal film [for gate electrode formation] while using the resist [processed to be] having tapered end surfaces as a mask;

[a first impurity-injecting step of] injecting impurities in high concentrations into [a] the semiconductor layer while using as a mask the provisional gate electrode having the resist with tapered side surfaces thereon;

[an isolated resist-etching step of] etching the resist to remove both end portions in the channel direction of the resist [reducing the provisional gate electrode in size towards the center by etching the resist bottom with the tapered side surfaces], thereby exposing both ends of the gate electrode in the channel direction;

[a provisional gate electrode end-removing step of] removing the exposed both ends of the gate electrode while using the remaining resist as a mask; and

[a second impurity-injecting step of] injecting the impurities in low concentrations into the semiconductor layer while using as

a mask the gate electrode [whose] with both ends [have been] removed.

3. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 2, wherein [characterized in that] processing the resist further comprises melting with heat the patterned resist and shaping the patterned resist into a hemisphere [the resist end surface-processing step is a resist-sphering step of shaping the resist patterned on the metal film for gate electrode formation like a hemisphere by melting it with heat].

4. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 2, [characterized in that the resist end surface-processing step] wherein processing the resist further comprises heating a top portion of the patterned resist on the metal film to shrink a top portion of the patterned resist, said heating at temperatures higher than a highest temperature at which preservation of shape of the resist is ensured[, is a heat-shrinking step of shrinking a top portion of the resist patterned on the metal film for gate electrode formation by exposing the

resist to predetermined temperatures higher than postbake temperatures at which resist material does not deform].

5. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 2, [characterized in that the resist end surface-processing step] <u>wherein processing the resist further comprises prebaking the patterned resist</u> [includes a low-temperature-prebake substep of prebaking the resist applied on the metal film for gate electrode formation] at lower temperatures than [prebaking temperatures determined by properties of resist material] <u>at the lowest temperature at which preservation of shape of the resist is ensured</u>.

6. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 5, [characterized in that the resist end surface-processing step] <u>wherein processing the resist</u> further [includes] <u>comprises</u>, in addition to <u>prebaking at</u> [the] low temperature [-prebake substep], [a defocus-exposing substep of] exposing the resist <u>on the metal film and patterning the resist</u> under a defocused condition [when the metal film for gate electrode formation is patterned] by photolithography.

7. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 6, [characterized in that the resist end surface processing step] wherein processing the resist further [includes] comprises, in addition to prebaking at [the] low temperature [-prebake substep] and [the] defocus-exposing [substep, a perforated pattern photomask-exposure substep of conducting an exposure] exposing the metal film for gate electrode formation with the use of a perforated pattern photomask and a negative photo resist [when the metal film for gate electrode formation is patterned] by photolithography.

8. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 2, [characterized in that the resist end surface-processing step is a resist end surface-removing step making use of a chemical reaction of area proportion] wherein processing the resist further comprises removing the tapered end surfaces with an area-proportional chemical reaction of the resist.

9. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 1, [characterized in that the

provisional-gate-electrode-making step includes] wherein forming a provisional gate electrode further comprises:

[a first resist-application substep of] applying a first resist having high postbaking temperatures on the metal film for gate electrode formation;

[a second resist-application substep of] applying a second resist having [lower] postbaking temperatures lower than the first resist on the first resist;

[an exposure-and-development substep of] exposing the first resist and the second resist [while] by using a mask for electrode formation, and then developing the first resist and the second resist;

[a high temperature-baking substep of] postbaking the first resist and the second resist at postbaking temperatures not causing the first resist to deform; and

[a provisional gate electrode-patterning substep of] forming a provisional gate electrode by pattering the metal film for gate electrode formation [while] by using the first resist and the second resist as a mask.

10. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 1, [characterized in that] wherein [the] forming a provisional gate electrode [-making step includes a low temperature-prebaking substep of] further comprises prebaking the resist applied on the metal film for gate electrode formation at [lower] temperatures lower than [prebaking temperatures determined by properties of resist material] the lowest temperature at which preservation in shape of the resist is ensured.

11. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 10, [characterized in that] wherein [the resist end surface-processing step further includes,] forming a provisional gate electrode further comprises, in addition to the [low temperature prebaking substep] prebaking the resist, [a defocus-exposing substep of] exposing the resist on the metal film and patterning the resist under a defocused condition [when the metal film for gate electrode formation is patterned] by photolithography.

12. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 11, [characterized in that the resist end surface-processing step further includes,] <u>wherein</u> <u>forming a</u> provisional gate electrode <u>further comprises</u> [, in addition to low temperature prebaking substep and the defocus-exposing substep a perforated pattern photomask-exposure substep of conducting exposure] <u>exposing the metal film for gate electrode</u> <u>formation</u> with the use of a perforated pattern photomask and a negative photo resist [when the metal film for gate electrode formation is patterned] by photolithography.

13. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 1<u>,</u> [characterized in that the method] further <u>comprising, prior to removing the resist,</u> [including an isolated resist-hemisphering step of hemisphering] <u>forming a hemisphere on</u> a surface of the resist [formed] <u>located</u> on the provisional gate electrode by melting at <u>a</u> fixed [temperatures] <u>temperature</u> higher than [its] <u>the</u> melting point or softening point <u>of the provisional gate electrode</u> [prior to the isolated resist-etching step].

14. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 13, [characterized in that the method further includes,] further comprising, prior to [the isolated resist-hemisphering step,] forming a hemisphere, selecting a melt flow resist [a melt flow resist-selecting step of selecting a melt flow resist] as the resist.

15. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 1, [characterized in that the method further includes] further comprising, prior to [the] removing the resist, [isolated resist-etching step, a resist-heat shrinking step of shrinking] heat-shrinking a top surface of the resist formed on the gate electrode by heating the top surface at a temperature [temperatures] higher than the highest temperature at which the resist material does not deform, thereby broadening both ends of the resist [downwardly].

16. (Amended) The method for fabricating an LDD thin film transistor in accordance with claim 1, wherein[, in the isolated resist-etching step,] removing the resist further comprises removing both end portions of the resist in [the] a channel direction [are removed] by [means of] ashing with [the use of] a gas containing at least one component gas selected from the group of component gasses comprising [of] O_2 and ozone.

17. (Amended) A method for fabricating an offset thin film transistor [including] comprising:

forming a semiconductor layer on the substrate;

forming a metal film on the semiconductor layer;

[a provisional gate electrode-making step of] making a provisional gate electrode from [a] the metal film for gate electrode formation by using a resist;

[an impurity-injecting step of] injecting impurities in high concentrations into [a] the semiconductor layer while using as a mask the provisional gate electrode having the resist used to form the provisional gate electrode [thereon] remaining on the provisional gate electrode;

[a resist end-tilting step of downwardly broadening] processing the resist to form a pair of tilted end surfaces each with a projecting lower edge for forming [both ends of the resist] in [the] a channel direction[, which is going to be used or has been used to form] the provisional gate electrode, before the [provisional gate electrode-making step] making a provisional gate electrode or before or after the [impurity-injecting step] injecting impurities;

[a resist-etching step of] moving both ends of the resist on the provisional gate electrode in the channel direction [towards] toward the center of the resist by etching the resist, thereby exposing both ends of the provisional gate electrode in the channel direction; and

[a gate electrode-forming step of] etching exposed both ends of the provisional gate electrode while using the remaining resist as a mask.

18. (Amended) A method for fabricating an LDD thin film transistor [including] comprising:

[a bottom gate transistor-formation basic step of] sequentially stacking a gate electrode, a gate insulator film, and

a semiconductor layer [in this order] onto <u>a front surface of</u> a substrate;

[a metal film-forming step of] forming a metal film for an impurity injection mask on the semiconductor layer;

[a resist film-forming step of] forming a resist film on the metal film;

[a resist film-patterning step of] patterning the resist film by exposing from a rear side of the substrate [while] <u>by</u> using the gate electrode as an exposure mask;

[a first impurity injection mask-forming step of] patterning the metal film for <u>forming a first</u> [the] impurity injection mask [while] <u>by</u> using the patterned resist film as a mask;

[a first impurity-injecting step of] injecting impurities in high concentrations from [the] <u>a</u> front side of the substrate while using the first impurity injection mask as a mask;

[an isolated resist end-tilting step of] treating the patterned resist on the patterned first impurity injection mask to have tilting side surfaces of both ends <u>of the patterned resist</u> in the channel direction towards the center <u>of the resist</u>;

[an isolated resist-etching step of] moving both ends of the resist in a channel direction towards the center <u>of the resist</u>,

thereby exposing both ends of the first impurity injection mask [provided] located under the resist, [which is so processed that] the resist having the side surfaces of both ends thereof [are] tilted in the channel direction towards the center of the resist;

[a second impurity injection mask-forming step of] removing the exposed both ends of the first impurity injection mask while using the remaining resist as a mask to form a second impurity injection mask; and

[a second impurity-injecting step of] injecting the impurities in low concentrations from the front side of the substrate while using the second impurity injection mask as a mask.

19. (Amended) A method for fabricating an LDD thin film transistor [including] comprising:

[a bottom-gate transistor-formation basic step of] sequentially stacking a gate electrode, a gate insulator film, a semiconductor layer, and a protective insulator film [in this order] onto a front surface of a substrate;

[a metal mask-forming step of] forming a metal film mask [for an impurity injection mask] on the semiconductor layer;

[a resist film-forming step of] forming a resist film on the metal mask;

[a resist film-patterning step of] patterning the resist film by exposing from a rear side of the substrate while using the gate electrode as an exposure mask;

[a first impurity injection mask-forming step of] patterning the metal film [for the] <u>to form a first</u> impurity injection mask while using the patterned resist film as a mask;

[a first impurity-injecting step of] injecting impurities in high concentrations from [the] <u>a</u> front side of the substrate while using the first impurity injection mask as a mask;

[an isolated resist end-tilting step of] tilting side surfaces of both ends of the patterned resist on the patterned first impurity injection mask in the channel direction towards the center <u>of the patterned resist</u>;

[an isolated resist-etching step of] moving both ends of the resist in a channel direction towards the center <u>of the resist</u>, thereby exposing both ends of the first impurity injection mask provided under the resist which is so processed that the side surfaces of both ends thereof are tilted in the channel direction towards the center <u>of the resist</u>;

[a second impurity injection mask-forming step of] removing exposed both ends of the first impurity injection mask while using the remaining resist as a mask; and

[a second impurity-injecting step of] injecting the impurities in low concentrations from the front side of the substrate while using the second impurity injection mask as a mask.

24. (Amended) A top-gate LDD thin film transistor comprising:

a gate electrode having a thickness of not less than 100 nm [nor more] <u>and not greater</u> than 250 nm; and

insulating reaction product films for coating both ends of the gate electrode in a channel direction, the insulating reaction product films being oxide films of the gate electrode material each being 0.075 -- 0.5µm long and thick enough to function as a mask at a time of impurity injection.

25. (Amended) A top-gate LDD thin film transistor [including] <u>comprising</u>:

a gate electrode having a thickness of not less than 100 nm [nor more] <u>and not greater</u> than 250 nm; and

insulating reaction product films for coating both ends of the gate electrode in a channel direction, the insulating reaction product films being oxide films of the gate electrode material each being 0.075 -- 0.5μm long and thick enough to function as a mask at a time of impurity injection, [the LDD thin film transistor is characterized in that] wherein

a semiconductor layer directly below the insulating reaction product films [has] comprises:

an offset region on a gate electrode side; and

a low-concentration impurity-injected region on a side opposite to the gate electrode side.

26. (Amended) A top-gate LDD thin film transistor [including] comprising:

a gate electrode having a thickness of not less than 100 nm [nor more] and not greater than 250 nm; and

insulating reaction product films for coating both ends of the gate electrode in a channel direction, the insulating reaction product films being oxide films of the gate electrode material each being 0.075 -- 0.5μm long and thick enough to function as a mask at a time of impurity injection, wherein

the LDD thin film transistor [is characterized in that] comprises a semiconductor layer located directly below the insulating reaction product films, [has] the semiconductor layer having a low-concentration impurity intruded region due to heat diffusion or scattering on the gate electrode side; and

a low-concentration impurity injected region on a side opposite to the gate electrode side.

28. (Amended) A top-gate LDD thin film transistor [including] comprising:

a gate electrode having a thickness of not less than 100 nm [nor more] and not greater than 250 nm; and

a semiconductor layer having, at each end in a channel direction under the gate electrode, an offset region on the gate electrode side and a low-concentration impurity injected region on a side opposite to the gate electrode side in a range having a length of 0.075 -- 0.5μm on both ends of the channel region provided under the gate electrode in the channel direction.

29. (Amended) A top-gate LDD thin film transistor [including] comprising:

a gate electrode having a thickness of not less than 100 nm [nor more] <u>and not greater</u> than 250 nm; and

a semiconductor layer having, at each end in a channel direction under the gate electrode, a low-concentration impurity intruded regions due to heat diffusion or scattering on the gate electrode side and a low-concentration impurity injected region on a side opposite to the gate electrode side in a range having a length of 0.075 -- 0.5µm on both ends of the channel region provided under the gate electrode in the channel direction.

32. (Amended) The top-gate LDD thin film transistor in accordance with claim 30, [characterized in that] <u>wherein</u> the semiconductor layer is a polysilicon layer.

33. (Amended) The thin film transistor in accordance with claim 32, wherein the electric resistance in [the] <u>said</u> low-concentration impurity injected region is 20 kΩ/❑ and 100 kΩ/❑.

34. (Amended) A method of fabricating an LDD thin film transistor [including] <u>comprising</u>:

[a first impurity-injecting step of] injecting impurities in low concentrations while using as a mask a gate electrode made from a metal film of 300 -- 500 nm-thick;

[a reaction product film-forming step of] forming reaction product films of 0.075 -- 0.5μm-long oxide films [or the like] of the gate electrode material metal at both ends of the gate electrode in a channel direction by applying a reactive fluid to the gate electrode; and

[a second impurity-injecting step of] injecting the impurities in high concentrations while using as a mask the gate electrode having the reaction product films at both ends thereof in the channel direction provided in the reaction product film-forming step.

35. (Amended) The method of fabricating an LDD thin film transistor in accordance with claim 34, [characterized in that] <u>wherein forming reaction product films</u> [the reaction product film-forming step is] <u>oxidizes with heat the gate electrode material metal to form a thermal oxide film</u> [thermal oxide film-forming step of forming the oxide films by oxidizing the gate electrode material metal with heat].

36. (Amended) The method of fabricating an LDD thin film transistor in accordance with claim 35 further [including a gate electrode material-selecting step of] comprising selecting an Mo-W alloy having Mo content of 15 -- 50 atom% as a material of the gate electrode.

37. (Amended) A method of fabricating an LDD thin film transistor, [including] comprising:

[a first impurity-injecting step of] injecting impurities in low concentrations into a semiconductor layer while using as a mask a gate electrode made from a metal film of 300 -- 500 nm-thick;

[a reaction product film-forming step of] forming reaction product films of 0.075 -- 0.5μm long oxide films [or the like] of the gate electrode material metal at both ends of the gate electrode in a channel direction by applying a reactive fluid to the gate electrode;

[a second impurity injecting step of] injecting impurities in high concentrations while using as a mask the gate electrode having the reaction product films at both ends thereof in the channel direction provided in [the] forming reaction product films [reaction product film-forming step]; and

a reaction product film-removing step of removing the reaction product films of the oxide films [or the like] of the metal in both ends of the gate electrode in the channel direction formed in [the] forming reaction product films [reaction product film-forming step].

38. (Amended) A method of fabricating an LDD thin film transistor, [including] comprising:

[a reaction product film-forming step of] forming reaction product films of 0.075 -- 0.5µm long oxide films [or the like] of the gate electrode material metal at both ends of the gate electrode in a channel direction by applying a reactive fluid to the gate electrode made of a metal film of 300 -- 500 nm-thick;

[a first impurity-injecting step of] injecting impurities in high concentrations while using as a mask the gate electrode having the reaction product films at both ends thereof in the channel direction provided in [the reaction product film-forming step] forming reaction product films;

[a reaction product film-removing step of] removing the reaction product films of the oxide films [or the like] of the metal in both ends of the gate electrode in the channel direction

formed in [the] forming reaction product films [reaction product film-forming step]; and

[a second impurity-injecting step of] injecting impurities in low concentrations while using as a mask the gate electrode from which the reaction product films have been removed.

39. (Amended) The method of fabricating an LDD thin film transistor in accordance with claim 37, wherein forming reaction product films further comprises forming a thermal oxide film as the reaction product film [is formed] by oxidizing the gate electrode material metal with heat.

41. (Amended) A method of fabricating an LDD thin film transistor, [including] comprising:

[a first impurity-injecting step of] injecting impurities in low concentrations while using as a mask a gate electrode made of a metal film of 300 -- 500 nm thick;

[a reaction product film-forming step of] forming reaction product films of 0.075 -- 0.5μm-long oxide films [or the like] of the gate electrode material metal at both ends of the gate

electrode in a channel direction by applying a reactive fluid to the gate electrode;

[a second impurity-injecting step of] injecting impurities in high concentrations while using as a mask the gate electrode having the reaction product films at both ends thereof in the channel direction provided in the reaction product film forming step; and

[a reverse reaction step of] returning the reaction product films of oxide films of the metal in both ends of the gate electrode in a channel direction formed in [the reaction product film-forming step] forming reaction product films to an original metal through a reverse reaction [such as] comprising reduction.

42. (Amended) The method of fabricating an LDD thin film transistor in accordance with claim 41, [characterized in that the reaction product film-forming step is] wherein forming reaction product films further comprises forming a thermal oxide film as the reaction product film [a thermal oxide film-forming step of forming the oxide films] by oxidizing the gate electrode material metal with heat.

43. (Amended) The method of fabricating an LDD thin film transistor in accordance with claim 41, wherein the gate electrode is made of an Mo-W alloy having Mo content of 15 -- 50 atom%.

44. (Amended) A method of fabricating an LDD thin film transistor, [including] <u>comprising</u>:

[an oxide film- forming step of] forming 0.05 -- 0.5μm-thick oxide films of the gate electrode material metal at both ends of a gate electrode in the channel direction by partly oxidizing the gate electrode which is made of a 300 -- 500 nm-thick metal film; and

[a diagonal direction high voltage impurity-injecting step of] injecting impurities at high voltages from both sides in the channel direction at the same time or in two installments while using as a mask the gate electrode provided with the oxide films.

45. (Amended) A method of fabricating an LDD thin film transistor, [including] <u>comprising</u>:

[an oxide film-forming step of] forming 0.05 -- 0.5μm-long oxide films at both ends of a gate electrode in the channel

direction by partly oxidizing the gate electrode which is made of a 300 -- 500 nm-thick metal film;

[a high voltage impurity injecting step of] injecting impurities at high voltages while using as a mask the gate electrode provided with the oxide films; and

[a dispersing step of] further dispersing the impurities which have been injected in [the high voltage impurity-injecting step] <u>injecting impurities at high voltages</u> and diffused towards the center of the gate electrode in the channel direction when a semiconductor is heat-processed after impurity injection or when the oxide films formed in both ends of the gate electrode are heated [to be] removed or reduced.

46. (Amended) A method of fabricating an offset thin film transistor, [including] <u>comprising</u>:

[a reaction product film-forming step of] forming reaction product films of oxide films of a 0.075 -- 0.5μm-long gate electrode material metal at both ends of the gate electrode in a channel direction by thermal oxidizing the gate electrode which is made of a 300 -- 500 nm-long metal film;

[an impurity-injecting step of] injecting impurities to the semiconductor layer in high concentrations while using as a mask the gate electrode provided with the reaction product films; and

[an oxide film removing step of] removing the metal oxide films in both ends of the gate electrode in the channel direction after the impurity-injecting step.

52. (Amended) The method of fabricating an offset thin film transistor in accordance with claim 46, [characterized in that the method further includes a semiconductor material-selecting step of selecting polysilicon as] wherein semiconductor material of the offset thin film transistor is polysilicon.

53. (Amended) The method for fabricating an LDD thin film transistor in accordance with [claims] claim 2, wherein[, in the isolated resist-etching step,] etching the resist further comprises removing both end portions of the resist in the channel direction are removed by means of ashing with [the use of] a gas containing at least one component gas selected from the group of component gasses comprising [of] O_2 and ozone.

54. (Amended) The method of fabricating an LDD thin film transistor in accordance with claim 38, wherein forming reaction product films further comprises forming a thermal oxide film as the reaction product film [is formed] by oxidizing the gate electrode material metal with heat.